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Please add new claim 21:

21. (New) A sensor for detecting the presence of moisture, comprising:  
a resonant circuit having a resonance frequency and being at least partly formed from a moisture sensitive material having an electrical resistance which increases when in contact with moisture,  
said at least one sensor comprising a microprocessor connected with said resonant circuit and in which an identification code is stored, the identification code being passed to said resonant circuit when said resonant circuit is resonated by an electromagnetic interrogation field.

### REMARKS

Reconsideration of the present application, as amended, is respectfully requested.

Please replace portions of the specification as indicated above and pending claims 1-19 with the revised form of the claims. Applicants draw the Examiner's attention to the fact that the pages and line numbers mentioned herein for pages 1-4b and claims 1-19 are based on the amended sheets as stamped by the International Bureau on December 5, 2000. Attached hereto is a marked-up version of the changes made to the specification and claims by the amendment. The attached appendix is captioned "Version with Markings to Show Changes Made."

#### A. STATUS OF THE CLAIMS

As a result of the present amendment, claims 1-19 and new claims 20 and 21 are presented in the case for continued prosecution. Claims 9, 11, 13-15 and 17 are objected to as being dependent on a rejected base claim but would be allowable if rewritten in independent form. As such, claim 21 is presented and includes subject matter of original claims 17 and 19. It is respectfully submitted that claim 21 should therefore be allowable over the prior art of record.

#### B. THE SPECIFICATION

The Examiner required correction of the specification. The amendment provided herein places the application specification in proper U.S. format and incorporates the changes requested by the Examiner, e.g., section headings at appropriate locations.

### **C. THE INVENTION**

The present invention relates to a system which enables the detection of the presence of moisture in objects from a location separate and apart from the objects. That is, sensors are incorporated into the objects for which the presence of moisture is to be detected and from a location separate and apart from the sensors, data indicative of the presence of moisture in the objects as detected by the sensors may be obtained in a wireless manner.

Specifically, the system includes one or more electronic sensors for detecting the presence of moisture each of which comprises a resonant circuit having a resonance frequency and is at least partly formed from a moisture sensitive material. The electrical resistance of the moisture sensitive material increases when in contact with moisture. The sensor is arranged to be wirelessly activated by an electromagnetic interrogation field when present therein to generate a response to the electromagnetic interrogation field.

The system also includes one or more reading devices for obtaining information from the sensor(s) about the presence of moisture in objects associated with the sensor(s). The reading device includes a transmitter-receiver for generating an electromagnetic interrogation field and recording the response of the sensor(s) to the electromagnetic interrogation field to obtain information about the presence of moisture at the sensor. The transmitter-receiver comprises at least one frequency component corresponding to the resonance frequency of the resonant circuit and is structured and arranged relative to the sensor(s) such that the electromagnetic interrogation field generated by the transmitter-receiver is wirelessly propagated and the response of the sensor(s) is wirelessly received by the transmitter-receiver.

### **D. REJECTIONS UNDER 35 U.S.C. §112, SECOND PARAGRAPH**

Claim 19 has been amended to be a second independent claim directed to the sensor used in the system of claim 1.

In view of the amendment made to claim 19 and the arguments presented above, it is urged that the rejection made under 35 U.S.C. § 112, second paragraph has been overcome. It is

therefore urged that the rejection under 35 U.S.C. §112, second paragraph, be withdrawn.

**E. REJECTIONS UNDER 35 U.S.C. §103(a)**

The Examiner rejected the subject matter of claims 1-5, 10, 12, 16 and 18 under 35 U.S.C. §103(a) as being unpatentable over DE 4030284 (DE '284) in view of Roberts (GB 2192059).

The Examiner's rejection is respectfully traversed on the grounds that DE '284 and Roberts do not disclose all of the features now set forth in claim 1.

As best understood, DE '284 relates to a system for detecting the presence of moisture which includes a sensor and associated reading device for obtaining data from the sensor.

There are several differences between the system of DE '284 and the embodiment of the invention set forth in claim 1. For example, unlike the claimed invention, there is no transmitter-receiver in DE '284 which generates an electromagnetic interrogation field which is wirelessly transmitted to sensors with the response from the sensors being likewise received in a wireless manner. Further, the electrical resistance of the moisture sensitive material in the DE '284 system decreases when it comes into contact with moisture, whereas the resistance of the moisture sensitive material according to claim 1 increases.

There is a significant difference with respect to the use of a material whose electrical resistance increases or decreases when in contact with moisture. Specifically, by using a material with increasing resistance, the Q factor of the intact dry sensor can be arranged to be relatively high. In that case, it is possible to check whether a sensor is present in, e.g., a diaper.

Roberts describes a device for determining the characteristics of a fluid in closed container. A piezo-electric generator 5 is mounted on the inside of the wall of a container 1 and is responsive to a mechanical shock. A tuned circuit including an aerial 6 is mounted on the generator 5. In response to a mechanical shock caused by an impulse generator 8, the generator 5 effects transmission of a radio frequency signal from the aerial 6.

There are several differences between the device of Roberts and the embodiment of the invention set forth in claim 1. For example, in Roberts, there is no moisture sensitive material and an electromagnetic interrogation field is not used.

Most importantly, DE '284 and Roberts do not teach or suggest a sensor which is wirelessly activated by an electromagnetic interrogation field when present therein to generate a response which is wirelessly received by a transmitter-receiver. For example, DE '284 and Roberts do not disclose the resonation of a resonant circuit of the sensor by an electromagnetic interrogation field generated by a transmitter-receiver.

Rather, in DE '284 the sensor is wired to the reading device and thus not wirelessly activated or resonated while in Roberts, the sensor is mechanically activated and is not activated by an electromagnetic interrogation field when present therein.

Furthermore, although the Examiner takes a position that it would have been obvious to modify DE '284 to include a means for wirelessly generating an electromagnetic field and wirelessly recording the response, in view of Roberts, the Examiner does not identify any reason or incentive why one skilled in the art would combine DE '284 and Roberts. In fact, in view of the absence of all of the features now set forth in claim 1, e.g., the wireless activation or resonation of a sensor by an electromagnetic interrogation field to generate a response, one skilled in the art could not combine any purported teachings of DE '284 and Roberts and arrive at the embodiment of the invention set forth in claim 1, or the embodiments set forth in claims 2-5, 10, 12, 16 and 18.

Accordingly, it is respectfully submitted that claims 1-5, 10, 12, 16 and 18 are patentable in view of DE '284 and Roberts.

Claims 6-8 are rejected under 35 U.S.C. §103(a) as being unpatentable over DE '284 in view of Roberts and further in view of Nishijima et al.

Nishijima et al. does not disclose the wireless activation of a sensor (e.g., the wireless resonation of a resonant circuit of a sensor) by an electromagnetic interrogation field to generate a response and thus does not overcome the deficiencies of the combination of DE '284 and Roberts.

In view of the foregoing, it is believed that the rejections under 35 U.S.C § 103 can be removed.

**F. EXTENSION OF TIME PETITION**

This response is being filed with a petition for a three-month extension of time and authorization to charge the fee therefor to Deposit Account No. 50-0217. This petition extends the deadline for filing the response from August 22, 2002 to November 22, 2002. No further fees are believed to be required. If, on the other hand, it is determined that any further fees are due or any overpayment has been made, the Assistant Commissioner is hereby authorized to debit or credit such sum to said Deposit Account.

Pursuant to 37 C.F.R. §1.136(a)(3), please treat this and any concurrent or future reply in this application that requires a petition for an extension of time for its timely submission as incorporating a petition for extension of time for the appropriate length of time. The fee associated therewith is to be charged to Deposit Account No. 50-0217.

**G. CONCLUSION**

In view of the actions taken and arguments presented, it is respectfully submitted that the present application is now in condition for allowance.

An early and favorable action on the merits is earnestly solicited.

Respectfully submitted,

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BY: 

Michael N. Mercanti

Docket No. 310.1019

**UNITED STATES PATENT AND TRADEMARK OFFICE**

Examiner: JACKSON, Andre K. Art Unit: 2856  
Re: Application of: VAN DE BERG, JAN  
Serial No.: 09/786,841  
Filed: September 19, 2001  
For: A SYSTEM FOR DETECTING THE PRESENCE OF  
MOISTURE

**APPENDIX- Version with Markings to Show Changes Made****IN THE SPECIFICATION:****Insert the following paragraph before line 1 on page 1:****--TITLE OF INVENTION --****The title at line 1 of page 1 has been amended as follows:****Title:** A system for detecting the presence of moisture**Insert the following paragraph after line 1 on page 1:****--CROSS-REFERENCE TO RELATED APPLICATIONS**

This patent application claims the benefit of priority from Dutch Patent Application No. NL 1010067 filed September 11, 1998 through PCT Application Serial No. PCT/NL99/00562 filed September 10, 1999, the contents of each of which are incorporated herein by reference.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT  
Not Applicable

INCORPORATION-BY-REFERENCE OF MATERIAL SUBMITTED ON A COMPACT  
DISC  
Not Applicable

**BACKGROUND OF THE INVENTION--.****Insert the following paragraph before line 27 on page 1:****--BRIEF SUMMARY OF THE INVENTION--.**

**Insert the following paragraph between lines 2 and 3 on page 4b:**  
**--BRIEF DESCRIPTION OF THE DRAWINGS--.**

**Insert the following paragraph between lines 19 and 20 on page 4b:**  
**--DETAILED DESCRIPTION OF THE INVENTION--.**

**The paragraph beginning at line 4 of page 3 has been amended as follows:**

The resistance of the fabric increases if it comes into contact with moisture. Furthermore, the resistance of the fabric is measured by a non-wireless connection to a measuring unit. The system is, however, not provided with a reading unit which generates an interrogation field with a frequency which corresponds with a resonance frequency of a resonance circuit of the sensor so that the resonance circuit is brought in into resonance by means of the interrogation field.

**The paragraph on page 7, beginning with the line "Example 1" has been amended as follows:**

Example 1:

<del>Stabilize</del> Stabilizer (0.5% in water)	50
water	10
glycerine (10% in water)	1.25
metallite silver SF 20	2.5
NaOH (10% in water)	0.25

Layer thickness wet	500µm
Layer thickness dry	100µm
Response time	<1 s

**The paragraph beginning at line 23 of page 9 has been amended as follows:**

Via line 16, information can again be supplied to the signal processing device 18 in the form of the amount of energy ~~taken up~~ absorbed from the electromagnetic interrogation field. The reading device 41 ~~4.1~~ can then determine on the basis of the amount of energy absorbed by the at least one sensor to what extent the at least one sensor is in contact with moisture. In particular, ~~it applies again that~~ the signal processing device 18 comprises a threshold circuit to determine whether the amount of energy ~~taken up~~ absorbed is below a predetermined value.

**The paragraph beginning at line 29 of page 11 has been amended as follows:**

In the example of Fig. 3, the sensor ~~again~~ comprises the microprocessor discussed before



above. When the sensor of Fig. 3 reacts, the identification code can then also be sent directly to the transmitter-receiver device, so that by means of the reading device it can be directly ~~establish~~ established which sensor reacts, in other words, which sensor is wet or moist. The transfer of the resonant circuit of Fig. 3 is therefore, such that curve A of Fig. 2 is applicable when the sensor is wet and curve B when the sensor is dry. It is also conceivable that each sensor 2.i comprises a resonant circuit with a unique resonance frequency  $f_i$ , with  $f_i \neq f_j$  if  $i \neq j$ . By emitting, i.e., generating or propagating, an interrogation field, the frequency of which increases in a previously known manner, it can be detected whether a sensor 2.i is moist, while at the same time the frequency  $f_i$  and thus the identity of a sensor can be established.

### **IN THE CLAIMS:**

**Claim 1 has been amended as follows:**

1. (Amended) A system (1) for detecting the presence of moisture, comprising:
    - at least one electronic sensor (2-i) for detecting the presence of moisture, said at least one sensor comprising a resonant circuit having a resonance frequency and being at least partly formed from a moisture sensitive material having an electrical resistance which increases when in contact with moisture, said at least one sensor being arranged to be wirelessly activated by an electromagnetic interrogation field when present in the electromagnetic interrogation field to generate a response to the electromagnetic interrogation field; and
    - at least one reading device (4-1) for obtaining information from the said at least one sensor about the presence of moisture,
- ~~wherein the at least one sensor (2-i) comprises a resonant circuit (6) which is at least partly formed from a moisture sensitive material (8), the electrical resistance of which changes when the material (8) comes into contact with moisture, the said at least one reading device (4-1) comprises comprising transmitter-receiver means (14) for generating an electromagnetic interrogation field comprising at least one frequency component corresponding to a the resonance frequency of the said resonant circuit (6) and for recording the response of the said at least one sensor (2-i) to the electromagnetic interrogation field to obtain information about the presence of moisture at the said at least one sensor, characterized in that, the electrical resistance of the material (18) increases when the material comes in to contact with moisture and the reading~~

device (4.1) comprising ~~transmitter-receiver means (14) for wirelessly generating the electromagnetic interrogation field and for wirelessly recording the response of the at least one sensor (2.i) to the electromagnetic interrogation field to obtain the information about the presence of moisture at the at least one sensor (2.i) if the at least one sensor (2.i) is wirelessly brought into the electromagnetic interrogation field.~~

said transmitter-receiver means comprising at least one frequency component corresponding to the resonance frequency of said resonant circuit.

said transmitter-receiver means being structured and arranged relative to said at least one sensor such that the electromagnetic interrogation field generated by said transmitter-receiver means is wirelessly propagated and the response of said at least one sensor is wirelessly received by said transmitter-receiver means.

**Claim 2 has been amended as follows:**

2. (Amended) A system according to claim 1, ~~characterized in that the~~ wherein said moisture sensitive material (8) is included in the said resonant circuit (6) in such ~~a manner~~ that the Q factor of the said resonant circuit (6) decreases when the resistance of the said moisture sensitive material (8) increases.

**Claim 3 has been amended as follows:**

3. (Amended) A system according to claim 1, ~~characterized in that the~~ wherein said moisture sensitive material (8) is included in the said resonant circuit (6) in such ~~a manner~~ that the Q factor of the said resonant circuit (6) increases when the resistance of the said moisture sensitive material (8) increases.

**Claim 4 has been amended as follows:**

4. (Twice Amended) A system according to claim 1, ~~characterized in that~~ wherein the said resonant circuit ~~at (6) least~~ comprises an LC circuit ~~(10,12).~~

**Claim 5 has been amended as follows:**

5. (Amended) A system according to claim 4, ~~characterized in that the entire wherein at least a portion of said LC circuit (10,12) or at least part of the LC circuit (10,12) is built up made~~ from the moisture sensitive material (8).

**Claim 6 has been amended as follows:**

6. (Twice Amended) A system according to claim 1, ~~characterized in that wherein~~ the moisture sensitive material (8) comprises a binding agent capable of swelling in moisture, ~~in which binding agent and containing~~ electrically conductive particles ~~are included~~.

**Claim 7 has been amended as follows:**

7. (Twice Amended) A system according to claim 1, ~~characterized in that wherein~~ the moisture sensitive material (8) comprises a binding agent ~~in which including~~ particles capable of swelling in moisture and electrically conductive particles ~~are included~~.

**Claim 8 has been amended as follows:**

8. (Twice Amended) A system according to claim 1, ~~characterized in that wherein~~ the moisture sensitive material (8) is arranged on a carrier material in the form of a coating.

**Claim 9 has been amended as follows:**

9. (Twice Amended) A system according to claim 4, ~~characterized in that wherein~~ at least part of the LC circuit (10,12) is formed by the a coating.

**Claim 10 has been amended as follows:**

10. (Twice Amended) A system according claim 1, ~~characterized in that the wherein said~~ transmitter-receiver means (14) are designed as a transmission system for detecting an electromagnetic response signal generated by ~~the said~~ at least one sensor (2-i), in response to the electromagnetic interrogation field.

**Claim 11 has been amended as follows:**

11. (Amended) A system according to claim 10, ~~characterized in that, in use, the~~  
~~wherein said at least one~~ reading device (4-1) determines on the basis of the intensity of the  
detected response signal to what extent the ~~said~~ at least one sensor (2-i) is in contact with  
moisture.

**Claim 12 has been amended as follows:**

12. (Twice Amended) A system according to claim 2, ~~characterized in that the~~ wherein  
~~said at least one~~ reading device (4-1) comprises a threshold circuit ~~arranged~~ to determine whether  
the detected intensity is below a predetermined value.

**Claim 13 has been amended as follows:**

13. (Twice Amended) A system according to claim 1, ~~characterized in that the~~ wherein  
~~said~~ transmitter-receiver means (1-4) are designed as an absorption system for detecting energy  
~~taken up~~ absorbed from the interrogation field by the ~~said~~ at least one sensor (2-i) in response to  
the electromagnetic interrogation field.

**Claim 14 has been amended as follows:**

14. (Amended) A system according to claim 13, ~~characterized in that, in use, the~~  
~~wherein said at least one~~ reading device (4-1) determines on the basis of the amount of energy  
absorbed by the ~~said~~ at least one sensor (2-i) ~~to what the extent the~~ to which said at least one  
sensor (2-i) is in contact with moisture.

**Claim 15 has been amended as follows:**

15. (Twice Amended) A system according to claim 2, ~~characterized in that the~~  
~~wherein said at least one~~ reading device (4-1) comprises a threshold circuit (1-8) ~~arranged~~ to  
determine whether the amount of energy absorbed is below a predetermined value.

**Claim 16 has been amended as follows:**

16. (Twice Amended) A system according to claim 1, ~~characterized in that the~~

wherein said at least one reading device (4.1) generates an alarm signal when moisture is detected by means of the said at least one sensor.

**Claim 17 has been amended as follows:**

17. (Twice Amended) A system according to claim 1, ~~characterized in that the system (1) is also designed as an identification system in which the~~ wherein said at least one sensor (2.1) comprises a microprocessor (22) connected with the resonant circuit (6); and in which microprocessor (22) an identification code is stored, which identification code is passed to the resonant circuit (6) when the resonant circuit (6) is resonated by the electromagnetic interrogation field, and the said at least one reading device (4.1) being arranged to read the identification code by means of the electromagnetic interrogation field.

**Claim 18 has been amended as follows:**

18. (Twice Amended) A system according claim 1, ~~characterized in that the system further comprises a central control unit (24) which is, optionally wirelessly, connected with the said at least one reading device (4.1) for obtaining information about the presence of moisture at the said at least one sensor (2.1).~~

**Claim 19 has been amended as follows:**

19. (Twice Amended) A sensor ~~(2.1) of the system according to claim 1 for detecting the presence of moisture, comprising:~~

a resonant circuit having a resonance frequency and being at least partly formed from a moisture sensitive material having an electrical resistance which increases when in contact with moisture, the moisture sensitive material being arranged on a carrier material in the form of a coating, at least part of said circuit being formed by said coating.

**Please add new claim 20:**

20. (New) A system according to claim 4, wherein the entirety of said LC circuit is made from the moisture sensitive material.

**Please add new claim 21:**

21. (New) A sensor for detecting the presence of moisture, comprising:  
a resonant circuit having a resonance frequency and being at least partly formed from a moisture sensitive material having an electrical resistance which increases when in contact with moisture,  
said at least one sensor comprising a microprocessor connected with said resonant circuit and in which an identification code is stored, the identification code being passed to said resonant circuit when said resonant circuit is resonated by an electromagnetic interrogation field.

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Michael N. Mercanti